

REMARKS

This paper responds to the Office Action dated December 17, 2003.

Claims 1-46 were pending prior to this Amendment. Claims 21-46 stand withdrawn due to a Restriction Requirement. New claim 47 has been added.

The Examiner rejects all of claims 1-20 as supposedly obvious in view of three-way combinations of U.S. Pat. No. 5,637,375 to Hohman ("Hohman") with two of any of several other references.

The Examiner, having withdrawn all rejections which were presented on appeal, and having reopened prosecution, has done new searching and has found a newly cited reference, Hohman. Hohman is cited, apparently, because it mentions "continuous fiber strands." (The limitation of "continuous fiber strands" was missing from all previously cited references.)

Briefly, even if one accepts the newly cited reference, at least four limitations in claim 1 are missing from any of the cited references. Reconsideration is requested and it is requested that claim 1 be allowed. Because dependant claims 2 - 20 depend from claim 1, it is requested they too be allowed.

New claim 47 has been added which is drawn upon claim 1 but which contains further limitations. It is requested that claim 47 also be allowed.

Differences from Hohman

Claim 1, with reference letters inserted for convenient reference, says:

A structural component of fiber-reinforced thermoplastic material comprising:

- (a) a shape-forming long-fiber-reinforced thermoplastic matrix and
- (b) separate, single load-bearing plastified and consolidated continuous fiber strands with a thermoplastic matrix
- (c) in a defined position within the structural component, the positions of the shape-forming long-fiber-reinforced thermoplastic matrix and the separate, single load-bearing plastified and consolidated continuous fiber strands with a thermoplastic matrix defining interfaces therebetween;
- (d) said continuous fiber strands being interconnected and having at least one load-transmitting flat internal connecting area between two continuous fiber strands;
- (e) wherein the single continuous fiber strands form a load-bearing supporting structure which is integrated in
- (f) and thermoplastically bonded to the long-fiber-reinforced thermoplastic matrix at the interfaces therebetween

It is true that the new reference Hohman cites the expression "continuous fiber strands" as a reinforcing material. But these thin "continuous fiber strands" are entirely different from the claimed strong and thick "separate, single, load-bearing continuous fiber strands".

Hohman teaches only the formation of layers of fibrous reinforcing material or fiber layers 14 which are load bearing and which may be composed of a large number of continuous fiber "strands". It is crucial to appreciate that in the context of Hohman, the "strands" mean filaments. Such filaments cannot be load-bearing.

The load bearing elements in Hohman are the fibers layers 14 and not strong separate, single,

load-bearing continuous fiber strands as in the claims.

Arguments regarding new reference Hohman

The Examiner states at page 3, line 3 in the Office Action:

The Hohman reference discloses that the second component (i.e. the layers 14 of fiber reinforcing material) has continuous fiber strands as per instant claim 1 (see column 9, lines 17-20).

It is correct that Hohman discloses here that

the reinforcing fibers may take the form of chopped fibers or continuous fiber strands such as employed in unidirectional tapes or braided layups ...

And Hohmann discloses also the use of a thermoplastic matrix.

But these known continuous fiber strands are thin-fiber filaments (which *per se* cannot be load-bearing) which are employed in forming layers 14 of fiber reinforcing material and only these fiber layers or plies 14 are load-bearing as the Examiner cites in Hohman, column 5, lines 5-8.

That the continuous fiber strands forming the fiber reinforced layers 14 are thin filaments is further disclosed in Hohman e.g. in column 5, line 32 - 33:

The fiber employed was a continuous strand of E-Glass yarn available from Owens Corning Fiberglass Corporation.

And in column 5, lines 41 - 42:

In formulating the test specimens, 14 layers of the fiber-glass yarn were braided on the aluminum tools ...

The teaching of Hohman is to form composite products of alternate fiber layers 14 and matrix layers 16 as shown in Fig. 1 and 2. The matrix layer 16 are short-fiber impregnated resin which improve or enhance interlaminar strength between the fiber layers 14.

The entire teaching of Hohman is to produce composite products with a plurality of alternative disposed layers of fiber mats 14 and resin layers 16 on a forming surface where the fiber layers 14 are load bearing.

There is no suggestion of the completely different structures of the claimed invention with the strong separate single load-bearing continuous fiber strands.

Stated differently, Hohman teaches shell- or layer-type structures, whereas the claimed invention discloses strong single strand structures (lattice-like structures).

Differences to cited References

The important difference to all cited References are the separate single load-bearing continuous fiber strands in limitations b, c, d, e of claim 1, as provided above for convenient reference.

This should already be clear in present claim 1.

In addition, new claim 47 has been added. This claim is drawn from claim 1 with some amendments shown in italics.

47. A structural component of fiber-reinforced thermoplastic material comprising:

- a a shape-forming, long-fiber-reinforced thermoplastic matrix and
- b separate, single load-bearing plastified and consolidated continuous fiber strands (3) with a thermoplastic matrix,
- c *each* in a defined position within the structural component, the positions of the shape-forming long-fiber-reinforced thermoplastic matrix and the separate, single load-bearing plastified and consolidated continuous fiber strand with a thermoplastic matrix defining interfaces there between;
- d said continuous fiber strands being interconnected and having at least one load-transmitting flat internal connecting area (7) between two *separate, single load-bearing* continuous fiber strands
- e and where the *separate, single load-bearing* continuous fiber strands are forming a load-bearing supporting structure (4) which is integrated in
- f and thermoplastically bonded to the long-fiber-reinforced thermoplastic matrix at the interfaces (6) therebetween.

It is emphasized that at a minimum, limitations b, c, d, and e are missing from the cited references.

To claim rejection - 35USC 103

Unobviousness To rejection of claims 1-8 and 10-19 as supposedly obvious over a two-way combination of US Pat. No. 5,637,375 to Hohman ("Hohman") with US Pat. No. 5,362,431 to Guerrini et al. ("Guerrini").

element	limitation	found in Hohman	found in Guerrini
	A structural component of fiber-reinforced thermoplastic material comprising:	yes	yes
a	a shape-forming, long-fiber-reinforced thermoplastic matrix and	no	yes
b	<u>separate, single load-bearing</u> plastified and consolidated <u>continuous fiber strands</u> (3) with a thermoplastic matrix,	no	no
c	<u>in a defined position</u> within the structural component, the positions of the shape-forming long-fiber-reinforced thermoplastic matrix and the <u>separate, single load-bearing</u> plastified and consolidated <u>continuous fiber strands</u> with a thermoplastic matrix defining interfaces therebetween;	no	no
d	said continuous fiber strands being interconnected and having <u>at least one load-transmitting flat internal connecting area (7)</u> <u>between two continuous fiber strands</u>	no	no
e	and where the <u>single continuous fiber strands are forming a load-bearing supporting structure (4)</u> which is integrated in	no	no
f	and thermoplastically bonded to the long-fiber-reinforced thermoplastic matrix at the interfaces (6) therebetween.		no

Present claim 1 will now be discussed in some detail, with limitations indicated as claim elements a, b, c, d, e, and f. In each case it is mentioned whether any of these limitations may be seen in either of the references that make up the two-reference combination.

These features are extensively explained and illustrated in the application as filed, for example:

feature (b) is shown in Figs. 1b, 2, 3, 25 (separate, single load-bearing continuous fiber strands (3));

feature (c) is shown in Figs. 2, 15, 25 (each in a defined position);

feature (d) is shown in Fig. 1b (with flat internal load transmitting connecting area (7));

feature (e) is shown in Figs. 2, 3 (forming a supporting structure (4));

The claimed invention

The objective of the claimed invention is to create a load-bearing structural component, which can fulfill demanding load-bearing functions and which can be manufactured cost-effectively and in different shapes and with short cycle times in a series production.

The integrated load-bearing supporting structure (4) is integrated in the shape-forming long fiber reinforced thermoplastic matrix (2) and is thermoplastically bonded (6) to it. The structure is built with separate single load-bearing continuous fiber strands (3) which must be in a defined position within the structural component and which are interconnected at load transmitting flat internal connecting areas (7) between the single continuous fiber strands.

With this strong integrated load-bearing supporting structure, which is positioned and integrated in the long-fiber thermoplastic matrix, the objective of the present invention is achieved.

The References

In contrast to this the references have completely different objectives and solutions, and there are no hints or suggestions of the limitations b, c, d, or e of the claim. It is important to consider all of limitations b through e.

Here the underlined features are not disclosed in reference Hohman and Guerrini.

- b) separate, single load-bearing plastified and consolidated continuous fiber strands with a thermoplastic matrix (3). The thin continuous filaments of Hohman are forming layers but there are no strong, separate, single load-bearing continuous fiber strands
- c) in a defined position within the structural component, the positions of the shape-forming long-fiber reinforced thermoplastic matrix and the separate, single load-bearing plastified and consolidated continuous fiber strand with a thermoplastic matrix defining interfaces therebetween
- d) said continuous fiber strands being interconnected and having at least one load-transmitting flat internal connecting area (7) between two continuous fiber strands
- e) and where the single continuous fiber strands are forming a load-bearing supporting structure (4) which is integrated in

In Hohman there are also no separate, single load-bearing fiber strands according to the limitations c, d, e.

The references Hohman and Guerrini do not disclose nor hint at a structural component with limitations b, c, d and e.

The dependent claims 2 - 20, depending on claim 1, should therefore also be allowable.

Respectfully submitted,



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